CONTENTS.

VOL. XV.

Page.

Activity in quarrying 70
Africa, North, submersion of 357
Air and ventilation..... 421
Algebraic process for maxima and minima..... 530
Amalgamation of iron..... 305
American architecture..... 246
American Institute of Mining Engineers..... 183
American iron exports..... 282
American iron-making..... 274
American Society of Civil Engineers 88, 182, 566
Ammonia process of treating ores 108
Angular cross-sectioning..... 44
Arches, stability of 33
Architecture, American..... 246
Artesian well in London..... 450
Art of measuring..... 159
Ascent of steep railway gradients 498
Asphalt 95
Association of Municipal and Sanitary Engineers and Surveyors..... 280
Axioms, geometrical..... 501

Belgian locomotives..... 45
Bessemer metal, manganese in... 433
Black Sea and the Caspian..... 122
Blast heating apparatus..... 165
Block system, defects of 513
Blown cast iron..... 89
Boiler experiments..... 228, 346
Boiler explosion, Thunderer..... 278
Boiler incrustation..... 545
Boiler, Lancashire..... 216
Boilers, strength of 72
Book Notices:
Adams, W. Alexander. Railway rolling stock..... 571
Anderson, R.C., C.E. Tables for facilitating the calculation of earthen and masonry dams 190
Beckett, Edmund, Bart. Astronomy without mathematics 571
Boireau, Raimond. Traitement practique des vins... 478
Boller, Alfred P., C.E. Iron highway bridges..... 93
Brown, John Croumbie. Reboisement in France, or records of the replanting of the Alps, &c..... 571
Browne, Walter Raleigh. Railway rolling stock..... 571
Buchan, Wm. Paton. Plumbing..... 478
De Saint Germain, A. Recueil d'exercises sur la mechanique rationelle..... 479
Douglas, S. H. and A. B. Prescott. Qualitative analysis . 286
Dowson, J. E. and A. Tramways, their construction and working 93
Fleming, Sanford, C.E. Historical sketch of Canadian railways 384

Page.

Book Notices:
Gillmore, Q. A., M.A., etc., etc. A practical treatise on roads, streets, and pavements..... 94, 191
Grant, John, M. Inst., C.E. Experiments on the strength of cement..... 286
Handbook of electrical diagrams and connections..... 93
Humber, William, C. E. A comprehensive treatise on the water supply of cities and towns..... 286
Magnus, Philip, B.A. Lessons in elementary mechanics... 383
McCulloch, Prof. R. S., C.E. Treatise on the mechanical theory of heat..... 93
Maxwell, J. Clerk. Matter and motion..... 571
Moscart, M. E. Traite d'electricitie statique 286
Nelson, Edmund, F. R. A. S. The moon and the condition and configurations of its surface..... 479
Notes on building construction. Part II..... 478
Parker, Commodore Foxhall A. The fleets of the world —The galley period..... 478
Penning, W. Henry, F.G.S. Field geology..... 384
Pickering, Prof. E. C. Elements of physical manipulation. Part II 190
Railway rolling stock..... 571
Reuleaux, F. The Kinematics of machinery—Outlines of a theory of machines..... 287
Richards, John. Wood conversion by machinery..... 572
Rosengarten, A. Handbook of architectural styles..... 287
Rosser, W. H. The law of storms considered practically 571
Schutzenbarger, P. On fermentation..... 94
Science lectures for the people. Seventh series..... 571
Sharp, Samuel. F.S.A., F.G.S. Rudiments of geology..... 94
Simon, John, M.D., F.R.C.S. Filth diseases and their prevention 383
Slagg, Charles. Sanitary work in the smaller towns and villages..... 286
Spangenberg, Ludwig. The fatigue of metals under repeated strains..... 190
Spinoza. Translations from the Latin of the Ethics of Spinoza..... 384
Thurston, R. H., A.M. Reports of the U. S. Commissioners to the Vienna Exhibition..... 286

Page.

Book Notices:
The Intercolonial..... 384
Tilden, William A., F.C.S. Introduction to the study of chemical philosophy.... 384
Toilhausen, Alexander. Technological dictionary in the English, German and French languages..... 571
Unwin, Prof. Wm. Cawthorne. Resistance of boiler flues to collapse..... 571
Von Bezold, Dr. Wilhelm. The theory of color in relation to art and art industry. Translated from the German by S. R. Koehler..... 478
Von Ott, Karl. The elements of graphic statics. Translated from the German by George S. Clarke..... 478
Warren, S. Edward. Course in descriptive geometry and stereotomy.. 479
Wood, De Volson, A.M., C.E. The elements of analytical mechanics 479

Bridge, continuous..... 145
British Association..... 451
Brooklyn bridge..... 380
Building, improvements in..... 172

Calculation of earthwork..... 358
Canal Du Midi..... 136
Canal, Soonkesala..... 385, 481
Casson-Dormoy puddling furnace 51
Cast iron, mixing of 40
Centennial Exhibition..... 192
Central Africa, metallurgy in 65
Century of mining and metallurgy 315
Channel tunnel..... 187
Chemical test of waters..... 138
Cincinnati music hall 374
Civil Engineers' Club of the Northwest..... 473
Coal gas, power and purity of.... 361
Compasses, how affected by iron masts..... 426
Compound cylinder locomotive.. 379
Computation of earthwork..... 225
Construction and maintenance of public highways 515
Construction of wells..... 469
Continuous bridges, theory of.. 145, 193
Continuous girder..... 289, 461
Continuous truss question, remarks on 563
Cost of railroad construction.... 475
Cost of the Settle and Carlisle railway 180
Crafts and craftsmen..... 410
Creosoted timber..... 88
Cross-sectioning, angular..... 44

Defects of the block system..... 513
Definition of steel..... 132
Dhu Heartach lighthouse..... 144
Discovery in steel manufacture.. 186
Dock commission, report of..... 53

Page.

Double ended ships of war..... 142
Du Midi Canal..... 136
Durability of impregnated sleepers..... 475

Earthwork, calculation of..... 558
Earthwork, computation of..... 225
Earthwork question..... 552
East River bridge..... 90
Economy of fuel.....228, 346
Edinburgh and Leith Engineers' Society..... 88
Effect of iron masts on compasses..... 426
Effect of manganese in Bessemer metal..... 433
Egerton's channel ferry and cattle ship..... 92
Eighth annual convention of the American Society of Civil Engineers..... 182
Electric light..... 480
Electricity in theory and practice. 531
Engineering as a profession..... 555
Errata..... 574

Fascine works of the Fen rivers.. 88
Fire feeder for grates, &c..... 377
First railway in China..... 187
Flagstone..... 95
Flow of fluids through nozzles... 240
Fluid compressed steel..... 536
Force..... 466
Forging, hydraulic..... 560
Formidable war engine..... 477
Free library and museum for Derby..... 112
French taxation on railway traffic 221
Friction between water and air.. 181
Fuel, economy of.....228, 346
Fuel for re-heating furnaces..... 464
Furnace, Casson-Dormoy..... 51

Gallium..... 96
Gas, illuminating power of..... 361
Gear wheels, teeth for..... 97
Geometrical axioms, original meaning of..... 501
German gun-boat Wespe..... 570
Girder, continuous.....289, 461
Gradients, steep..... 498
Gramme machine..... 49
Great blast at Hell-Gate..... 476
Great guns..... 285
Gun carriage, Moncrieff..... 375

Hardening of steel..... 473
Healthy habitations..... 436
Heat, theory of..... 276
Hell-Gate, blast at..... 476
Highland Agricultural Society... 87
Highways, construction and maintenance of..... 515
House building, improvements in 172
Hudson River tunnel..... 569
Hydraulic forging..... 553
Hydrochloric acid..... 181

Improvement in safety lamps 480
Improvements in blast heating apparatus..... 165
Improvements in house building. 172
Incrustation in boilers..... 545
Influence of Living roots on putrefaction..... 129
Innocuous glaze for earthenware. 480
Institution of Civil Engineers. 88, 280
Institution of Mechanical Engineers..... 377
Integrating machine..... 301
Intensity of colored lights..... 96
Inter-Continental tunnel..... 569
Iron, amalgamation of..... 305
Iron, cast..... 40
Ironclads of European powers... 382
Iron-making, American..... 274
Iron masts, effects of, on compasses..... 426
Iron, preservation of, from rust... 304
Iron rails, endurance of..... 332
Iron trade prospects..... 127
Iron, value of..... 471

Page.

Iron v. wooden ships..... 188
Iron wire..... 50
Irrigation works in India..... 113

Japan, mineral resources of..... 424
Japanese Hemp..... 572

Kinematic principle, new..... 301

Lancashire boiler..... 210
Lead in its relations to water supply..... 81
Levers for reclaiming lowlands... 415
Locomotives for steep gradients.. 498
Locomotive trials..... 187

Manganese in Bessemer metal.... 433
Manufacture of dynamite..... 480
Manufacture of iron rails..... 332
Manufacture of steel..... 335
Masts, iron, effect of on compasses..... 426
Materials, refractory..... 401
Materials, resistance of..... 254
Maxima and minima..... 530
Measurement..... 71
Measuring, art of..... 159
Mechanical puddling..... 377
Mechanical theory of heat..... 276
Mediæval and modern crafts and craftsmen..... 410
Metallurgy, century of..... 315
Metallurgy in Central Africa... .. 65
"Mild" steel..... 378
Mineral resources of Japan..... 424
Mining, a century of..... 315
Mississippi jetties..... 284
Mixing cast iron for foundry purposes..... 40
Moncrieff gun carriage..... 375
Monolithic aqueduct..... 284

Narrow gauge in India..... 68
New analyne dye stuff..... 96
New nomenclature of iron and steel..... 567
New odontograph..... 1
New suspension bridge at Minneapolis..... 569
New York Dock Commission.... 53
Note on the continuous girder discussion..... 461

Odontograph, new..... 1
Oil pipe..... 331
Ores, ammonia process for..... 108
Original meaning of geometrical axioms..... 501

Paris, water supply of..... 207
Peat as fuel..... 464
Permanent way of railways..... 130
Piece-work among workmen..... 345
Pneumatic system of sewerage... 96
Power of coal gas..... 361
Premiums on engineering essays. 280
Prime movers..... 265, 309
Process for preserving iron from rust..... 304
Profession engineering as a..... 555
Production of Bessemer Steel.... 186
Production of Steel in France.... 418
Proper definition of steel..... 132
Proposed submersion of North Africa..... 357
Propulsion for street cars..... 20
Protection, river..... 38
Protecting iron from rust..... 567
Public highways..... 515
Puddling furnace..... 51

Railroad across the Eastern Continent..... 380
Railroading in India..... 568
Railroad fog signal..... 475
Railroads of the world..... 284
Railroad progress in Peru..... 187
Rail joints, strength of..... 46
Railway engines and rails, weight of..... 568
Railway features of the Centennial Exposition..... 283

Page.

Railway gradients, steep..... 498
Railway in the Isle of Wight..... 75
Railway operation in France..... 423
Railways in China..... 379
Railways, permanent way of..... 130
Railway signals and blocks..... 89
Railway speeds..... 419
Railways, proposed light, for the Weald of Kent..... 563
Refractory materials..... 401
Remarks on continuous truss question..... 563
Report of the New York Dock Commission..... 53
Resistance of materials..... 254
Ridge and furrow glass roofs for railroad stations..... 414
Right to drawings..... 95
River protection in Nebraska.... 38

Salt wood..... 288
Sanitary works abroad..... 430
Sawdust as fuel..... 464
Scottish Society of Arts..... 87
Serious engineering miscalculation..... 569
Severn tunnel..... 573
Sewage treatment..... 76
Ships of war, double ended...142, 193
Slag, utilization of..... 560
Society of Civil Egineers..... 88
Soonkesala Canal.....385, 481
Sounding boards..... 90
South Pass improvement..... 182
Speed of trains..... 379
Spring propulsion for street cars. 20
Stability of arches..... 33
Steel, compressed..... 536
Steel, hardening of..... 473
Steel in France..... 418
Steel, manufacture of..... 335
Steel process, Uchatius.....282, 474
Steel, proper definition of..... 132
Steel, structure of..... 223
St. Gothard tunnel..... 90
Stone tramways in Italy..... 35
Street cars, propulsion for..... 20
Street paving and cleansing..... 192
Strength of boilers..... 72
Strength of rail joints..... 46
Stretching the cables..... 380
Structure of steel..... 222
Stucco..... 368
Submersion of North Africa 357
System for reclaiming lowlands.. 415

Taff Vale railway..... 514
Teeth for gear wheels..... 97
Tilps' locking bolt..... 89
Thames inundations..... 535
Theory and practice of electricity 531
Theory of continuous bridges. 145, 193
Theory of heat, mechanical..... 276
Thin iron..... 89
"Thunderer" boiler explosion... 278
Trade, iron..... 127
Tramways, stone..... 35

Uchatius steel.....282, 474
Underground pumping engines... 284
Use of rail ends in blast furnaces. 89
Utilization of Slag..... 560
U. S. steamer Trenton..... 477

Value of iron..... 471
Ventilation.....88, 421
Ventilation in France..... 96
Ventilation in railway tunnels.... 38
Vienna waterworks..... 252

War ships, double ended.....142, 193
Water and air, friction between.. 181
Water, chemical test of..... 138
Water supply of Paris..... 207
Waterworks, Vienna..... 252
Welding iron..... 525
Wells, construction of..... 469
Wells, yield of..... 29
Whithworth gun, the..... 570
Wooden dowels..... 384
Wood, sawdust, and peat, as fuel. 464
Yield of wells sunk in chalk..... 29